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ABSTRACT

This guide presents a discussion on how constant new discoveries cause science to endure, which necessitates successive alterations in inquiry and methodology. The curriculum was formulated based on the author's perception of child development levels. The cognitive, social and physical characteristics of second-grade students are listed. The main objectives pertaining to the study of science are listed and discussed. In the second half of the guide, the actual science curriculum is presented. The objectives, major goals, specific goals, supporting content and learning activities are also included. (Author/SB)

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"MAN AND HIS ENVIRONMENT:

A

SUGGESTED CURRICULUM

FOR

SECOND-GRADE STUDENTS"

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Science appears to be an exciting but in many ways difficult area of study to pursue in a pedagogical setting. The material has definite relevance for any human being who seeks to understand phenomena and changes occurring within or surrounding him/her. Particularly for the child, who seems naturally curious and interested in learning new things that will provide answers about that which he/she does not know, science can be deemed unquestionably necessary (to any school curriculum). However, owing to the complexity of the discipline and the continuous alterations in theories and fact or knowledge which new discoveries, capabilities, interests and concerns foster, science is difficult indeed to teach. Distinct from reading for example, scientific knowledge, techniques and skills cannot be taught at one period in development and applied consequently by a student in the same way throughout the remainder of his/her life. By asserting for example a once-presumed fact that the earth was the center of the universe, a student today would not be able to deal sensibly with modern scientific thought. Modifications or entire changes must constantly be made in order to provide an individual with an accurate image of himself and the world in which he/she lives.

Given the complexity of the discipline and its numerous and varied subdivisions, it has been my concern in the construction of a science curriculum for a second-grade classroom in the suburban area of Menton, New York to create learning situations for each individual child which will foster an understanding of change or non-permanency in the field of science

as well as be pertinent to the needs and interests of the person. As I hope the objectives provided in the following pages will demonstrate, it is my contention that change can be optimally recognized with respect to science through observing, questioning, discovering and conducting new investigations. In this way one learns that science evolves with new discoveries which are made through successive alterations in inquiry and methodology.

Aside from an attempt to foster the development of understanding of the nonpermanence of scientific concepts or ideologies, it is my intent in formulating this curriculum to help children comprehend that which is meaningful or relevant at their present ages of six or seven and is consequently of probable interest to them. The yearly plan which follows has been constructed around the theme of "Man and his Environment" according to primarily to my perception of the developmental levels which second graders generally have achieved. Several of the cognitive, social and physical characteristics which I used to formulate goals for the plan are that children in second grade appear to:

1. Maintain a need for concrete learning although some abstract education becomes possible.
2. Have maintained a preoccupation with their immediate surroundings although they are increasingly able to deal with past and future time and regions or cultures different from their own.
3. Be able generally to read and express themselves in written and verbal forms so that ideas are clearly presented.
4. Have retained an interest from earlier years in themselves. There is a continuously developing awareness of one's body, its uniqueness from others and its change over time.
5. Be more mobile and independent than at earlier ages.
6. Have developed an awareness and increased interest in other individuals, particularly their peers.
7. Or rather, actually are encountering growth through newly achieved height and weight as well as additional teeth losses.

Owing principally to the still-dominant orientation of the six or seven-year old toward immediate environments and, to sustained interest in oneself, I chose to explore the individual: his/her bodily structure and parts, the function of these parts, changes which occur through growth and the process of birth which has been an experience commonly shared. Moreover, I sought to relate man to other animals and plants through the classification of "living things" in order to help students of these ages make comparisons and contrasts and be aware of diverse aspects of their environment. Geology, meteorology (temperature) and energy sources are briefly considered also in order to help each child to understand the structure of the land in which he/she lives, the sources of some forms of change within the environment and how man uses the environment in order to survive.

Finally, given an awareness of one's environment and increased independence, I felt that units regarding self-care and conservation of one's environment were logical and necessary to complete one's understanding of human beings and their environment. It will be anticipated that through learning why certain foods, sleep and excercise are needed, what medicine does and what happens to human wastes, that children of this age will assume more responsibility for their actions, be (more) willing to assist others (people, plants and animals) and be conscious generally of the society in which they live.

In particular, I believe that the unit on pollution is extremely significant to the science curriculum presented here because it:

1. Considers common aspects of the environment: air, water, animals and plants,
2. Directly involves man and hence relates directly to the daily existe existence of the students and,
3. Demonstrates our need as human beings for help from certain parts of our environment, therefore highlighting the interrelationship between man and his surroundings.

In addition to gaining an understanding of the region in which they live and how they and other living things function and interact with their environments, it was my desire also to provide students with an understanding of what science is and involves with respect to observation, data collection and testing based on questions and hypotheses. Moreover, given the social stages of development and the educational need for learning to foster creative and critical thought, I have attempted to allow for interaction, between class members through discussions and work and would where possible, stress cooperation as a necessary condition for effectively accomplishing a task. Divergent responses are to be encouraged, problem-solving techniques focused upon and experience with analysis of conditions provided where possible.

In the unit outlined broadly for pollution, I have attempted to provide activities and construct entire learning situations that would foster not only an understanding of man and his environment but also assist in cognitive and social development of each individual. However, I recognize that my plans and the curriculum in general are lacking in respects one might perceive to be fundamental to a second-grade-science curriculum. One might reasonably question my choice of principles to be covered...or find that the material included is too extensive to be covered within a single year. First, I will admit in response to such claims that I have no justification for studying those aspects cited of man and his environment rather than those of evolution, prehistoric eras, chemistry, physics, engines or astronomy or other scientific fields except for reasons delineated above and my subjective evaluation of what is important to children of this age. Second, it is necessary to point out that my aim in choosing to treat a multitude of issues was to allow for a spiral curriculum throughout the elementary school years. In this way, aspects can be treated more fully

at other periods in time or considered in greater depth as cognitive skills and interests develop or change. The principles are therefore hardly exclusive to what one might teach by having such objectives as I have here.

Finally, in considering this curriculum, it is necessary to realize that evaluation of understanding or mastery of specific skills must be executed concurrently or immediately following the activities presented. This can be carried out in the form of observation of how an individual attacks a problem; evaluation of a project with respect to specific criteria; written or oral exams where recall or vocabulary is focused upon; checklists, particularly where work is conducted on an independent basis or interviews, where conceptual understanding, processes followed, procedures chosen or conclusions arrived at are focused upon. Different evaluation forms will lend themselves to certain situations and frequency of evaluation should be determined by needs of the teacher and student as well as by the goals professed. However, above all else, it is most significant to recognize ways in which an individual is able to apply what he/she has learned to other situations. In this way, learning is quite evident.

Menton- is a factory town boardered on two sides by rivers and bypassed by a new highway. Mountainous regions are within a forty-mile radius of the town. This New York location received federal funding five years ago to supplement local financing of a water and sewage treatment plant. The town boasts a reasonably large library and is within one hour of a planetarium, and small science museum.

Material resources in Menton:

1. Downtown district where businesses and factories are.
2. White-stone-brick building: post office
3. Two rivers and a reservoir
4. Transparent figure of human body with removable parts and dentist molds
5. Aquariums, animal cages, jars, plant pots, terrariums and a zoo two hours from Menton
6. Magazine pictures, films
7. School building, classroom
8. Dentists and doctors in the town
9. Local health department and factories
10. First aid kits, dieticians, physical education teachers
11. Thermometers, microscope, small burner, refrigerator accessible
12. School and town libraries for research and materials
13. A wealth of art supplies

General objectives pertaining to the study of science:

1. Children will increase abilities to solve problems.
2. Children will learn to make sensible hypotheses after gaining an understanding of the process involved in making predictions.
3. Children will be able to follow directions.
4. Children will learn to observe carefully.
5. Children will learn the difference between fact and opinion.
6. Children will become more adept at thinking of ways in which to test their hypotheses.
7. Children will learn to take responsibility for materials used and care well for them.
8. Children will learn to work cooperatively in groups and to work independently.
9. Children will be able to monitor and record changes (compile data); to analize in a basic manner the test results and to formulate generalizations
10. Children will be encouraged to think divergently and to express themselves freely.
11. Children will learn to apply concepts and skills to other situations and daily life style.

Science curriculum proposed for a second grade classroom in Menton, New York

Teachers are to allow one-half an hour daily for instruction in this field. Longer periods may be necessary and/or possible where science, math, social studies or reading can be combined. Some possible combinations for this would be: measurement/change, vocabulary and reading/science, art/science, transportation/energy sources, jobs of people in our society/work of a scientist.

I. Who am I?

A. Children will become aware of their individual characteristics that make them unique from others.

B. Children will be able to identify certain body parts and generally describe the role of each.

1. Arms, hands, fingers, toes, heels, feet, ankles, knees, legs, hip, stomach, chest, lungs, ribs, heart, backbone/spine, heart, shoulders, neck, head, brain, hair, eyes, ears, tongue, teeth, eyes, ears, mouth, skin

II. Children will be able to differentiate between living and non-living forms after understanding why objects are classified together as living things.

A. Children will understand that all living things are composed of cells which have specific functions.

1. Cells are "building blocks of life".
2. Cells are composed of a nucleus and are surrounded by thick walls.
3. Cells carry food to different parts of our bodies.
4. Cells divide and multiply as our bodies change.
5. Living things need more cells as they grow because there is more work to do.

B. Children will recognize that most living things can move by themselves.

1. Mobility
2. Man has muscles and joints that help him to move
   a. There are two basic types of joints.
   b. Muscles expand and contract as we move.
3. Other animals (birds, monkeys and kangaroos) have body structures that help them to move

C. Children will learn that living things need air and water to survive.

1. Animals and plants all braeth.
2. Man breaths through lungs and his skin. (perspiration and respiration.)
3. Fish and some other animals breath through gills.
4. Plants absorb gases from the air.
5. Animal and plants will become dehydrated or will dry out without a sufficient amount of water.

D. Children will understand that living things are aware of many things around them.

1. Man has senses which help him to know what is happening around him.
2. Senses help to keep one safe.
3. Sight, hearing, taste, touch and smell are the five senses. They serve like telephone lines. The eyes (or other receptors) send messages through lines we call <u>nerves</u> to the brain. The brain then considers the message, thinks about what it means and sends an answer to the eye about what was seen or what should be done (when and using what muscles), eaten felt etc.

4. Taste buds help one to taste things differently. (Sweet Bitter Salty Sour)

5. Nerve endings on our finger tips are very sensitive to texture and temperature. (soft, hard, dull, sharp, cold, hot, crisp, smooth)
6. Animals also perceive things through senses but their's are less diversified and equally developed.
   a. (Fish) and dogs have acute hearing.
   b. Cats have keen sight.

E. Children will be able to identify their heart and its function as well as several other animals with hearts.

1. The heart serves as a pump for delivering food through cells in the blood to different parts of one's body.
2. Veins are like roads through which food travels.

F. Children will understand that all living things need to reproduce themselves because they die. (separate unit for reproduction)

G. Children will recognize that all living things grow and change in different ways.

1. Differences in growth among people of the same age can be found.
2. Differences in growth among people of different ages is also evident.
3. Children will learn that a puppy grows much more rapidly than a person or tree.

H. Children will be able to recognize differences between living things and will be able to classify them in separate groups depending on these differences.

1. Animals can be divided into specific groups: Mammals, Reptiles, Amphibians, Anthropods and Crustaceans
2. Some animals have backbones but others do not. Backbones provide for movement and support.
3. Plants are different from any animal in form.
   a. Plants have six basic parts: stem, root, bud, seeds or bulbs, flowers, leaves
   b. Stems: All plants have stems which send food from roots to the leaves. Water and minerals are carried up the stem to the leaves. Bigger plants need larger stems to support leaves and feed the plant. (Celery dye)
   c. Roots: are made up of two parts
      1) Tip: digs into the ground to get more food for the plant and to provide support
      2) Hairs: grab minerals etc. and last only a few days or at most, weeks.
   d. Leaves: Leaves receive water and minerals sent from the roots and stem. Then, taking light from the sun, they change water and minerals into food for the plant.
      1) Leaves can be classified as either single or compound.
      2) Grass, shrubs, evergreens and broad-leaved trees all have different kinds of leaves.

I. Students will recognize that all living things produce waste which they need to dispose of.

1. Some animals and all people have kidneys which hold all liquid wastes.
2. Wastes produced in the body are poisonous and therefore need to be dispelled.

J. Children will be able to describe differences between non-living and living things based on what has been learned thus far.

III. Children will understand what birth means and will learn that certain types of living things are born/reproduced in various ways.

A. Children will recognize that a waiting period is required so that the animal or plant can develop sufficiently to survive on its own.

B. Children will learn that the new being needs to be protected.

C. Children will discover that animals and plants need food and some need warm or somehow special environments in which to develop.

D. Children will be able to identify some animals or plants which can only be produced at certain times of the year.

E. Note: Comparisons can be made between the birth of a mouse, dog or cat and a bird or fish...and these in turn related to the birth of a butterfly. Moreover, plant development from stems (potatoes), bulbs and seeds might be explored.

IV. Children will understand that plants and animals need things in their environment in order to survive and reproduce.

A. Children will be able to identify elements which plants and/or animals need.

1. Plants need: water, soil, air, light, and heat
2. Animals need: light, air, heat, water, food, (warmth) and shelter
3. Temperature keeps track or measures how much heat there is in something. (Understanding of temperature and ability to measure changes in it will be taught.)
4. Sources of heat need also to be discussed.

B. Children will recognize that they need each other and themselves in order to live.

1. Infant is cared for by others.
2. Food is available with the help of many workers as well as food and shelter.

C. Children will recognize that plants and animals each need one another.

1. Animals take in oxygen and exhale carbon dioxide.
2. Plants exhale oxygen and absorb carbon dioxide.
3. This interchange of elements helps things to live.
4. Optional: Children will understand that when living things die they can be buried in the soil and with them, their remains produce minerals and vitamins which plants and other living things need.

D. Children will be able to describe how wood, coal and water serve as energy sources to help man do work.

V. Students will learn to identify seasons by changes in the natural environment and will understand how alterations affect living things.

A. Children will be able to state why many animals need to look for a warmer place to live in the winter.

1. Migration
2. Heated homes

B. Children will recognize that some reptiles, rabbits and other animals change color during different seasons to protect themselves.

1. Camouflage

C. Children will be able to explain the hibernation habits of bears and the storage habits of food by squirrels and other animals.

D. Children will be able to recognize changes in plants during different seasons and in the earth itself (hardness vs. softness of soil etc.)

VI. Students will learn that all living things eventually die.

A. Death: a termination of life due to the exhaustion of or depletion of bodily resources or forces.

B. Children will learn that animals and plants which cannot find things by which they need to live, will die.

1. Extinction
2. Dinosaurs

VII. Children will discover that the earth is made up of many different materials which are shaped and mixed together in certain ways depending on the types of materials in a regional area and historical/geological forces involved.

A. Materials: layers of rock, minerals, soil, water

B. Layers of rock are formed by strong pressure that pushes all small pieces together.

C. Water if strong and steady enough can divide materials or change their shape.

D. Different temperatures can produce solid, liquid or gaseous forms of the same item.

VIII. Children will learn why it is necessary to take care of oneself and how to do so as well as develop skills that can be used to take care of animals.

A. Children will understand the primary functions of food.

1. Food helps one grow,
2. Food gives one energy.
3. Food helps to repair worn-down body parts.

B. Children will be able to identify the different types and amounts of food one needs from the four food groups.

1. Milk group: 2-3cu. per day
2. Vegetable and fruit group: four or more servings per day
3. Meat group: two servings per day
4. Breads and cereals: four servings per day

C. Children will recognize that different families eat different foods and have different likes and dislikes for certain foods.

D. Children will understand that sleep is necessary for animals and people.

1. Every part of one's body needs to rest each day so that it can work efficiently.
2. Children of these primary grades need an average of 11 hours of sleep per night.

E. Children will be able to describe some of the results of not getting sufficient amounts of sleep.

F. Children will understand why the body needs excercise; its function and will be able to cite different kinds of excercise.

1. Excercise helps build strong muscles so one can do work.

G. Children will be able to define primary and permanent teeth and their two basic parts (crown and root) and, will be able to explain why and how it is important to take good care of them.

H. Children will understand the function of doctors, shots and medicine and will be able to explain why it is important not to either take too much medicine or to take someone else's.

I. Children will understand that baths or showers are necessary for people.

1. Our bodies produce sweat from work we do which can have a strong odor.
2. Sweat glands and pores

J. Children will understand that house pets and other animals needs food, sleep and excercise like people do.

1. They will be able to suggest ways to provide house pets with these needed things.
2. Children will understand that animals get sick like people do and sometimes need to visit a veterinarian and/or take medicine.

IX. Children will learn why it is necessary to take good care of our environment and how this can be done.

(See succeeding pages for details of this unti.)

Content Area: Science/Pollution

Major Goal: Students will be able to define what pollution is, be able to describe several of its forms and their sources, and be able to explain why it is important to rid our environment of these types.

Specific goals for children	Supporting content	Activities
II. WATER POLLUTION		
A. Children will become familiar with the variety of uses for water in American society in order to recognize the tremendous volume needed daily.	-uses: cooking; drinking; washing; irrigation; cleaning; swimming; boating; industry -Pleasure uses -Work uses (home, school, industry)	1) Give each individual or pair of individuals a task to do while in a group. a) Ask the children what they might need to perform the task. b) Seek general demand for water. c) Chart uses for water. d) Discuss other ways in which water is used. 2) Visit a factory to see how water is converted to steam as a power source. OR 3) Ask the children to list all the different things which their families use water for in their homes in order to arrive at the huge volume of water needed altogether in our country.
B. Children will learn what some of the sources of water are in general and where and how it is stored for public use.	-Wells in rural areas -Rivers, lakes, ponds, oceans, brooks -Hills and melted snow -Water is stored in large storage tanks in cities or reservoirs.	1) Chart sources of water which children know. 2) Visit a reservoir or hike to a water tank. 3) Read about wells if not applicable to home area.

Specific goals for children	Supporting content	Activities
		4) Hike to a mountain and follow river to trail.
C. Children will learn how water is transferred from these storage areas to their homes, schools or businesses.	-Water is transferred through water pipes underground.	1) Pose question of where water in a faucet comes from. 2) Visit a city public water system if possible. 3) Discuss how years ago people used aqueducts to carry water from one place to another. 4) Explore pipes in classroom of a school and trace to the basement where water lines are.
D. Children will discover that water from a pond or river is often different from that which comes out of a faucet. (less clean)	-Water drunk is clear, without odor and leaves no ring on things. -Water from ponds also is discolored from soil or other substances, is odorific and leaves a residue.	1)Collect water samples from different sources. 2) Discuss and chart similarities and differences after children study them. 3) Judge the cleanest according to specific criteria.
E. Children will understand what water pollution signifies and will be able to explain how it develops ...what causes it.	-Waste materials/substances make water dirty. -Germs can be carried into the water and hence pollute it.	1) Experiment with different materials to see what happens to water when combinations are made. 2) Observe a sewer or walk along a river bank. 3) Hypothesize from these excursions what water pollution means.

Specific goals for children	Supporting content	Activities
		4) Discuss what could happen if one were to drink water with trash etc. in it- characterize the condition of items disposed of in water.
F. Children will be able to describe the function served by a water treatment plant and will understand the basic operations involved in purification.	-A water treatment plant separates bad substances from good so that the water becomes pure enough so that it will not hurt/harm us.	1) Ask children how water could become clean again. Experiment: removing trash... adding clean water etc. or chart oral responses. 2) Discuss the role of a treatment plant. 3) Demonstrate the role of a treatment plant through means of a sifter, funnel and boiling water (as a sterilizing agent).
G. Children will learn that water pollution must be reduced if not stopped completely.	-Water supplies are limited. -Water treatment plants can only clean water to a certain extent. -Fish and other animals can be harmed by water pollution.	1) Visit a dam and talk about water levels. a)Discuss man's reliance on rain. b)Discuss droughts. 2) Re-experiment to show how some things can by-pass cleaners at the plants. 3) Read, see a film about oil spills and how they affect animals. Experiment with oil colors to show how oil reacts when combined with water.

Specific goals for children	Supporting content	Activities
II. AIR POLLUTION		
A. Children will be able to cite several sources of air pollution and will understand why they cause/contribute to pollution.	-Sources: smoke, dust, pesticides, aerosal sprays, gasoline fumes and industry exhaust	1) View a film about pollution in the air or read about it. 2) Take a trip to the down-town area of a city and past factories. Record smells and sights. a) Discuss what was seen and sources of pollution. b) Chart the causes. c) Define how each signifies pollution. 3) Squirt an odorous aerosal in the room. Record its character and how long it takes to disappear.
B. Children will be able to identify/recognize several effects of air pollution.	-Effects: sore eyes, sneezing, difficult breathing, dirty and smelly clothes and buildings, haze	1) Take a walk around downtown areas and outside of schools. Observe dust and film collecting on window sills and discoloration of stone buildings where there are any. 2) Spray a strong perfume on an article of clothing. Discuss how the smell sticks. 3) Discuss the job of fire fighters. Why do they wear masks when the smoke is heavy? 4) Draw a picture of the sky on a sunny day if one lives in an area where there is smog.

Specific goals for children	Supporting content	Activities
C. Children will be able to identify methods which could be used to alleviate the pollution problem.	-Bicycles, walking -Wind -Machines to clean exhaust fumes emitted.	1) Write a story and/or draw a picture of a city with pollution and how the people did away with it. 2) Present the problem of a polluted blanket of air sitting over a city. How could it be removed? 3) Chart benefits to the use of fewer automobiles for travel.
III. FOOD POLLUTION		
A. Children will be able to define what bacteria are in general and will be able to identify conditions which foster their production.	-Bacteria are microscopic organisms that can make a person/animal sick. -Bacteria grow well where there is heat, air and moisture. -Refrigerators minimize development of harmful bacteria. -Unwrapped food often is more susceptible to bacterial growth.	1) Experiment with a slice of bread in different conditions and/or applesauce. a) Record any changes in color. b) Additional shapes forming? c) Odor? 2) Identify bacteria and conditions in which it grows best. 3) Generalize from the results of the experiment the need for refrigeration and/or the covering of food.
B. Children will understand why meats and other foods have to be inspected and expiration dates cited.		1) Provide examples of foods with inspection stamps and expiration dates. 2) Produce a chart of food types which need to be checked carefully.

Specific goals for children	Supporting content	Activities
C. Children will be able to explain what pasteurization means.	-Milk is produced with certain bacteria in it which should be removed. Pasteurization does this.	1) Take a trip to a farm if possible. Record in picture or prose what was seen and how pasteurization is carried out. a) If not convenient, read a book or show a film. 2) Taste the unprocessed and processed milk. a) Discuss differences. b) Discuss reasons for the differences.
IV. OTHER TYPES OF POLLUTION		
A. Children will be able to provide reasons for the disposal of trash, will understand where and how it is disposed of and why.	-Trash is waste material. -Trash piled up breeds insects, germs and rats. -Trash is usually removed to an area outside a city and buried or burned if possible.	1) Have children draw a picture of trash as they conceive of it. 2) Chart what constitutes trash. 3) Ask students to hypothesize results of trash and garbage left in one's house or on streets. 4) Visit a city/town dump. a) Observe what is done with all the trash. b) Discuss why it is located where it is. OR: Ask a city health official to come and explain the job of trash collectors and the reasons why it is necessary to remove trash from a house and neighborhood.